## 7.8 WATER RESOURCES

### 7.8.1 Affected Environment

#### *Climate*

Average annual rainfall within KTA and KLOA ranges from 40 to 50 inches (102 to 127 centimeters) near the coast to 150 inches (381 centimeters) at the summit of the Koʻolau Mountains. Prevailing winds in summer are northeasterly trade winds; in the winter, light south to southwesterly winds prevail, but on some unprotected coastal slopes, average wind speeds of 18 to 20 knots have been recorded (USARHAW and 25th ID[L] 2001a).

Annual evaporation rates vary from about 80 inches (203 centimeters) near the coast to about 20 inches (51 centimeters) on the mountain ridges (Oki 1998).

Drum Road runs along the west slope of the Koʻolau Mountain Range and across the Schofield Plateau, from KLOA, through KTA to SBMR. The road lies within an elevation range of about 1,000 to 1,200 feet (305 to 365 meters) msl, except in the segment between Helemanō Stream and SBMR, where the trail descends to below 900 feet (274 meters) msl. Along most of its route, the average annual rainfall is above 70 inches (178 centimeters). In the last segment, where the trail descends to SBMR, the average rainfall decreases with elevation to about 50 inches (127 centimeters) per year. Annual evaporation exceeds rainfall in this last segment.

#### *Surface Water*

*Surface Water Drainage in Kuhuku Training Area*

Figure 7-14 shows surface water features and watershed boundaries on KTA, which straddles the northern Koʻolau Mountain Range and contains portions of four watersheds. On the west side of KTA is the Paumalū watershed. The Paumalū watershed includes drainages from Paumalū Stream on the west to Waialeʻe Gulch on the east. The headwaters of the Paumalū Stream are in the Pūpūkea Paumalū Forest Reserve, most of which is within the boundaries of KTA. KTA does not include the downstream portion of the Paumalū Stream, but most of the watershed east of the Paumalū drainage, almost to the Kamehameha Highway, is on KTA.

To the east of Paumalū watershed and wedged between it and the ʻŌʻio watershed farther to the east is the Kawela watershed, which includes the streams that drain to Kawela Bay—Pahipahiʻālua Stream and Kawela Stream.

East of Paumalū and Kawela watersheds is the ʻŌʻio watershed, which includes the upper portions of drainages from ʻŌʻio Gulch east to Keaʻaulu Gulch, which discharges at the town of Kahuku.

Adjacent to the ʻŌʻio watershed is the Mālaekahana watershed, which consists of the upper drainage of Mālaekahana Stream.

**Figure 7-14**
Watershed Boundaries and Drainage Features on Kahuku Training Area

The lower reaches of many of these streams have been diverted or captured for irrigation and flood control, but the upper reaches, on KTA, are generally the natural drainages.

All streams and gulches on KTA are intermittent, except for Mālaekahana Stream which is perennial (USARHAW and 25th ID[L] 2001a).

*Surface Water Drainage in the Kawailoa Training Area*

The ROI for KLOA is the same as the ROI for Drum Road (discussed below), because with the exception of traffic on Drum Road and for purposes of the impact assessment for water resources, training activities within KLOA would not differ from training activities under No Action. Therefore, the discussion of KLOA is included in the discussion of Drum Road. The portion of Drum Road that lies within or adjacent to KLOA is shown on Figure 7-14, and includes the western boundary of the northern half of KLOA.

*Surface Water Drainage on the Drum Road Route*

Figure 7-15 shows the alignment of Drum Road. Helemanō Trail, which extends from the Helemano Military Reservation to Schofield Barracks, is discussed in Section 5.8. South of KTA, Drum Road passes along the western perimeter of the KTA. First, it crosses the Waimea watershed, which is drained by several streams, including Kauwalu Gulch, ʻElehāhā Stream, Kamananui Stream, and Kaiwikoʻele Stream. (Kauwalu Gulch and ʻElehāhā Stream are both intermittent, while Kamananui and Kaiwikoʻele Streams are both perennial [flow year-round].) ʻElehāhā Stream and Kamananui Stream are tributaries of the Waimea River.

The trail passes along the ridge that forms the boundary between the head of the Keamanea, Waimea, and Kawailoa watersheds, northwest of Puʻu Kapu. At about this point, the trail follows the Pūpūkea Road and crosses inside KLOA. Here, west of Puʻu Kapu, it crosses the tiny Kawailoa watershed and then follows the ridge separating the Kawainui and Kawaiʻiki watersheds (on the east) from the Anahulu watershed (to the west). The Kawailoa watershed is a narrow east-west trending strip of land, north of Puʻu Kapu, that does not have any surface outflow but probably drains below the surface to the adjacent watersheds. The Kawainui and Kawaiʻiki streams (both perennial streams) are tributaries of the Anahulu River, which occupies the Kawailoa Gulch and discharges at Waialua Bay, north of Haleʻiwa. The junction of the two streams marks the head of the Anahulu watershed. The intake of the Kamananui Ditch and Tunnel, which was designed to divert water from the Kawainui Stream for irrigation in the Keamanea watershed, is at the downstream end of the Kawainui watershed.

The trail emerges from KLOA just east of ʻŌpaeʻula Reservoir, where it becomes a paved road. The road follows the boundary of the Kawaiʻiki watershed, then turns sharply west and continues along the ridge separating the Anahulu watershed and the ʻŌpaeʻula watershed. The ʻŌpaeʻula Reservoir is in the Anahulu watershed but is recharged by diversions from the Kawaiʻiki and ʻŌpaeʻula streams, via ditches or tunnels that cross the watershed boundaries.

**Figure 7-15**
Watershed Boundaries and Drainage Features Drum Road/Helemanō Trial

Southwest of the ʻŌpaeʻula Reservoir, Drum Road crosses the ʻŌpaeʻula watershed and the ʻŌpaeʻula Stream (a perennial stream) and then follows Twin Bridge Road, west of Bryans Mountain House. This segment of the trail is on the boundary between the ʻŌpaeʻula watershed and the Helemanō watershed.

#### *Surface Water Quality*

None of the watersheds on KTA have been identified as Category I watersheds in need of restoration. The watersheds crossed by Drum Road south of the Kawailoa watershed are identified by the state of Hawaiʻi as tier 2 Category 1 watersheds (HDOH 1998b).

Soil erosion has been identified as a potential problem in many areas of the Koʻolau Mountains. Among the major causes of soil erosion, as identified by the KMWP (Sumiye 2002), are human activities, wildfire, and soil disturbance by pigs. Human activities with the potential to cause erosion, in addition to military training, include hiking, motor biking, and illicit drug cultivation. The KMWP notes that these activities have not been identified as severe threats to watershed resources but that the watershed may be affected by these activities in the future as intensity of human use increases.

### ***Groundwater***

#### *Groundwater Flow*

KTA overlies the ridge of the Koʻolau Mountain Range, which is considered to be a hydrologic boundary between the north and windward hydrologic sectors. The western side of KTA is in the Kawailoa aquifer system of the north hydrologic sector. The Kawailoa aquifer system is west of the Summit Trail and Kaunala Ridge and is the northward extension of the ridge to the west side of Kawela Bay. The Kawailoa aquifer system is within the central Oʻahu groundwater flow system (Oki 1998). Groundwater in the Kawailoa aquifer system is thought to drain northwest toward the Waimea coast.

Since 1927, annual groundwater pumping from the Kawailoa aquifer system reportedly remained below 9 MGD and ranged from 1.5 MGD in 1936 to 8.9 MGD in 1970. The State of Hawaiʻi estimates the sustainable yield of the Kawailoa aquifer system at 39 MGD. Most of the past groundwater withdrawals were reportedly from the Waialua Sugar Company's irrigation wells near Kawailoa Camp (Oki 1998). The Waialua Sugar Company ceased operating on Oʻahu in 1996.

The eastern side of KTA is in the northern end of the Koʻolauloa aquifer system of the Windward hydrologic sector. Regional groundwater flow is believed to be to the north or the northeast in this part of KTA. The State of Hawaiʻi estimates the sustainable yield of the aquifer system at 35 MGD. Most of KTA is within the Northwest Rift Zone of the Koʻolau Volcano. The Northwest Rift Zone is densely intruded by volcanic dikes, and the groundwater system at higher elevations is dominated by dike-impounded groundwater. The Northwest Rift Zone is primarily within the Koʻolau Loa aquifer system but extends into the Kawailoa aquifer system. The extreme northwest side of KTA marks the western boundary of the Northwest Rift Zone, where dike density decreases.

The coastal plain north and east of KTA is underlain by sedimentary deposits, including alluvial deposits and limestone caprock.

Drum Road crosses the upper portions of the Kawailoa and Waialua aquifer systems in the north hydrologic unit and the central part of the Wahiawā aquifer system in the central hydrologic unit.

*Groundwater Quality*

Groundwater in the high-level groundwater system of the Koʻolau Mountain Range is generally of very good quality and is used as a drinking water source. On the coastal plain, groundwater has been affected by agricultural contamination. Groundwater in the Koʻolau Loa aquifer system has been affected by pesticides used in sugar cultivation, including dibromochloropropane (DBCP) and 1,2,3-trichloropropane (TCP) (HDOH 1999b). Groundwater beneath the coastal plain north of KTA has been affected by nitrates and sulfates associated with crop fertilizers and irrigation (Tenorio et Al. 1970).

## 7.8.2 Environmental Consequences

### *Summary of Impacts*

A summary of impacts for water resources is provided in Table 7-18. Significant and mitigable impacts on surface water quality would result from the Proposed Action and RLA Alternative because Stryker off-road training would cause severe erosion on the limited terrain available at KTA. Less than significant impacts on surface water quality would result from nonpoint source chemical loading, erosion from construction activities, accidental spills on Drum Road, and flooding and erosion along Drum Road. There would also be less than significant impacts on groundwater supply from the Proposed Action and RLA Alternative.

**Table 7-18**
**Summary of Potential Water Resources Impacts on KTA/KLOA**

| Impact Issues | Proposed Action | Reduced Land Acquisition | No Action |
|---|---|---|---|
| Impacts on surface water quality | ⊘ | ⊘ | ⊘ |
| Impacts on groundwater quality | ⊙ | ⊙ | ⊙ |
| Increased flood potential | ⊙ | ⊙ | ⊙ |
| Groundwater supply | ○ | ○ | ○ |

In cases when there would be both beneficial and adverse impacts, both are shown on this table. Mitigation measures would only apply to adverse impacts.

LEGEND:

⊗ = Significant
⊘ = Significant but mitigable to less than significant
⊙ = Less than significant
○ = No impact
\+ = Beneficial impact
N/A = Not applicable

### *Proposed Action (Preferred Alternative)*

*Significant Impacts Mitigable to Less than Significant*

*Impact 1: Impacts on surface water quality.* Based on ATTACC modeling results, the Proposed Action would severely degrade land condition. MIMs are expected to increase from 7,211 under existing conditions, to 13,772 under the Preferred Project. Under existing conditions, the effects of maneuver training on land condition are considered moderate. However, the land condition would fall to a "severe" condition under the Proposed Action. Referring to Figure 2-5, which shows the maneuverable areas available on KTA (areas with slopes less than 30 percent and unrestricted by vegetation), it can be seen that there are relatively few large contiguous areas available for maneuver training. Therefore, the effects of training would be concentrated on the limited available land and there would be little opportunity to rotate training to other areas to allow damaged lands to recover. The implication of this in the relatively steep terrain, with high annual rainfall, is that it would also significantly increase soil erosion. Erosion would not occur all at once but would be progressive. If not mitigated, the rate of erosion would steadily increase as more land area was disturbed and vegetation cover decreased. However, with mitigation, impacts on stream water quality from sediment loading is expected to be controlled within acceptable levels. The mitigation measures below will reduce the impacts on surface water quality to less than significant.

*Regulatory and Administrative Mitigation 1.* The Army will implement design measures in accordance with new Phase II Stormwater Management Regulations of the Clean Water Act. The Army will choose the most practicable solution for the specific project or project area during design. As directed via NPDES permit approval, the contractor will be required to implement a stormwater pollution prevention program during construction.

The Army will continue to implement land restoration measures identified in the INRMP. Mitigation measures include, but are not limited to, implementing of the ITAM program to identify and inventory land condition using a GIS database; coordinating between training planners and natural resource managers; implementing land rehabilitation measures identified in the INRMP; monitoring the effectiveness of the land rehabilitation measures; evaluating erosion modeling data to identify areas in need of improved management; and implementing education and outreach programs to increase user awareness of the value of good land stewardship.

The Army will develop and implement a DuSMMoP for the training area, which will address measures such as, but not limited to, restrictions on the timing or type of training during high risk conditions, vegetation monitoring, soil monitoring, and buffer zones to minimize dust emissions in populated areas. The plan will determine how training will occur in order to keep fugitive dust emissions below CAA standards for $PM_{10}$ and soil erosion and compaction to a minimum. The Army will monitor the impacts of training activities to ensure that emissions stay within the acceptable ranges as predicted and that environmental problems do not result from excessive soil erosion or compaction. The plan will also define contingency measures to mitigate the impacts of training activities that exceed the acceptable ranges for dust emissions or soil compaction.

The Army will implement the existing spill prevention and response plan to all new lands and activities under the Proposed Action.

The IWFMP for Pōhakuloa and O'ahu Training Areas was updated in October 2003. The Army will fully implement this plan for all existing and new training areas to reduce the impacts associated with wildland fires. The plan is available upon request.

For construction of low-water stream crossings, the Army will incorporate BMPs that will reduce runoff and sedimentation to aquatic environments in accordance with CWA regulations for stormwater runoff at construction sites.

### *Less than Significant Impacts*

*Impacts on surface water quality from nonpoint chemical loadings.* There are no live-fire exercises using ball or tracer ammunition planned on KTA, so there would be no potential for surface water quality to be affected by residual explosives residues. However, other chemicals, such as petroleum hydrocarbons that may spill or leak onto soils as a result of vehicle use or refueling, could be bound to soil particles and then transported to surface water by erosion. These impacts are expected to be less than significant because spills would be addressed effectively through standard procedures, including training personnel in spill prevention and control techniques and requirements, maintaining appropriate spill control equipment in areas where refueling may occur, and complying with all hazardous materials management regulations.

*Impacts on surface water quality from use of dust control palliatives.* Applying calcium, magnesium chloride, calcium lignosulfonates, or other environmentally friendly materials to control dust could affect surface water quality, either by increasing the biological oxygen demand or by increasing total dissolved solids concentrations. These impacts are expected to be less than significant because the chemicals would be applied according to industry standards (Parametrix, undated).

*Impacts on surface water quality from new construction sites.* During ground preparation for new construction sites, grading, excavating, and trenching may expose erodible soils to stormwater runoff, with the potential for sediments to contaminate surface waters. Similarly, chemicals could spill during equipment refueling, by hydraulic lines on heavy equipment breaking, or by using chemical solvents, paints, and other chemicals in construction. These potential impacts would be reduced to less than significant levels by implementing standard construction BMPs, as required for compliance with construction and Phase 2 stormwater management regulations.

At a minimum, the following standard construction BMPs would be implemented:

- Dredging, filling, or grading in or adjacent to streams and riparian areas would be scheduled to occur during low-flow periods and would be in compliance with the Clean Water Act.

- No project-related materials (such as fill, revetment rock, and pipe) would be stockpiled in the water or in riparian areas.
- All project-related materials and equipment placed in the water would be cleaned prior to use to ensure that they are free of pollutants.
- Trash or debris would be collected and disposed of properly. Equipment and materials brought from outside KTA would be cleaned and inspected prior to transport to ensure that alien species are not introduced.
- Project vehicles and equipment would be fueled away from streams and riparian areas.
- Turbidity and siltation from project-related work would be minimized and contained to the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse weather conditions.

*Impacts on surface water quality from potential spills on Drum Road.* A spill response plan and SOPs would be implemented to control any accidental spills that may occur. Preventative measures would include training personnel in spill avoidance and response, safe driving practices, and the proper way to transport hazardous materials in compliance with Army, state, and federal regulations. Some of the hazards of spills and accidents would be reduced compared to No Action because public roads, with their inherent risks of accidents involving civilian vehicles, would be avoided.

*Increased flood potential - Flooding and erosion of Drum Road.* Drum Road will be upgraded, including widening it, hardening the surface, installing new drainage systems, and improving stream crossings. (The environmental effects of the improvement project are evaluated in a separate document.) After construction, the assumption is that the potential for flooding would be reduced and that erosion impacts would be reduced, compared to existing conditions; however, impacts may occur due to failure of the new road with heavy use or because of unforeseen extreme natural conditions. Widening the road would likely require making additional slope cuts and fills, installing drainage conduits, and including other engineering features that would require monitoring and maintenance. Therefore, any potential impacts on surface water quality is expected to be reduced to less than significant levels through appropriate monitoring and timely implementation of repairs.

#### *No impact*

*Groundwater supply.* At KTA, water is trucked in and there is no draw on the local groundwater supply. The Proposed Action will not result in any new draw on the local ground water supply and would not contribute to groundwater contamination. The Proposed Action will have no impact on groundwater supply.

### *Reduced Land Acquisition Alternative*

The impacts associated with RLA are identical to those described for the Proposed Action.

### *No Action*

#### *Significant Impacts Mitigable to Less than Significant*

*Impact 1: Impacts on surface water quality from soil erosion associated with training exercises.* Under No Action, the potential for eroding soils to affect surface water quality would continue to be potentially significant. ATTACC modeling results indicate that the current land condition has been moderately affected by training and that the current rates of soil erosion exceed the goal of long-term sustainability.

*Regulatory and Administrative Mitigation 1*. Mitigation measures would be the same as those described above for the Proposed Action.

#### *Less than Significant Impacts*

*Impacts on surface or groundwater quality from spills on public roads*. Heavy Army vehicles and slow-moving convoys using public roads can increase the potential for traffic accidents involving civilian vehicles. These accidents could result in releases of hazardous chemicals, with consequent impacts on surface water or groundwater quality. Adherence to standard Army operating procedures is expected to continue to result in a less than significant impact on water quality.

#### *No Impacts*

*Groundwater supply.* The groundwater issue is unchanged from the Proposed Action to the No Action alternative. The No Action Alternative is not expected to significantly increase local water demand.